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ABSTRACT

The Task Force on Global Biodiversity of the National Science Board is charged with developing a course of action for the National Science Foundation to follow to promote responsible management of global biological diversity. Effective management of the problem is hampered by a shortage of systematic biologists--scientists who identify, document, and classify living things. A study was conducted to gather information on systematic biology training and personnel to gauge the magnitude and severity of the shortfall of scientists. The survey collected information on the 1988-89 academic year from institutions with graduate-level systematic biology programs. All 168 doctorate-granting institutions (108 public and 60 private institutions) in the United States were surveyed. A total of 108 institutions reported that they currently train graduate students in systematic biology. The survey collected information on the following: departments training graduate students in systematic biology, and department composition; numbers of graduate students, postdoctoral fellows, faculty members, and degree recipients in systematic biology; distribution of personnel by minority group membership, citizenship, and developing country status; major disciplinary approach within systematic biology; sources and amounts of support for study and research; need for types of employment positions in systematic biology; faculty vacancies in biology and in systematic biology; and probable areas of future faculty hiring. (JDD)

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Survey Number 10
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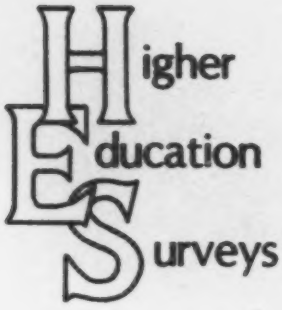

SYSTEMATIC BIOLOGY

TRAINING AND PERSONNEL

Sponsored by and written for:

The National Science Foundation
National Science Board
Committee on International Science
Task Force on Global Biodiversity

Prepared by:

Westat, Inc.
Carin A. Celebuski, Survey Manager
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Higher Education Surveys Report
Survey Number 10
May 1990

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- W. Franklin Harris, Executive Secretary, National Science Board, Task Force on Global Biodiversity, National Science Foundation
- Patricia White, HES Program Officer, Science and Engineering Education Sector Studies Group, National Science Foundation
- Mary Golladay, Study Director, Science and Engineering Education Sector Studies Group, National Science Foundation.

Members of the Task Force on Global Biodiversity and the systematic biology community who contributed to the questionnaire design and presentation of survey results include the following:

- James L. Edwards, Acting Deputy Director, Division of Biotic Systems and Resources, National Science Foundation
- William S. Moore, Program Director, Systematic Biology, Division of Biotic Systems and Resources, National Science Foundation
- David E. Schindel, Associate Program Director, Systematic Biology, Division of Biotic Systems and Resources, National Science Foundation
- James E. Rodman, Associate Program Director, Systematic Biology, Division of Biotic Systems and Resources, National Science Foundation

From Westat, Pat Cruz was the data preparation supervisor for the survey, and Warren Mason was the programmer.

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Executive Summary

Background

The Task Force on Global Biodiversity of the National Science Board is charged with developing a course of action for the National Science Foundation to follow to promote responsible management of global biological diversity. The decline in global biological diversity, characterized by the extinction of species and the degradation of ecosystems, is being caused primarily by human activity. Effective management of the problem is hampered by a shortage of systematic biologists -- scientists who identify, document, and classify living things. These scientists play a critical role since the biotic inventories and classifications they produce are needed to understand biotic diversity and to monitor changes. Currently, the inventories available are far from complete.

The Task Force requested that a Higher Education Surveys (HES) study be conducted to gather information on systematic biology training and personnel to gauge the magnitude and severity of this shortfall. The HES survey collected information on the 1988-89 academic year from institutions with graduate-level systematic biology programs. It gathered data on the number of students currently training to become systematic biologists, including students from developing countries where the problems tend to be more severe and the need for management greater. Information on the faculty makeup of departments training these students was also collected. Specifically, detailed information was collected on the following:

- Departments training graduate students in systematic biology, and department composition
- Numbers of graduate students, postdoctoral fellows, faculty members, and degree recipients in systematic biology
- Distribution of personnel by minority group membership, citizenship, and developing country status
- Major disciplinary approach within systematic biology
- Sources and amounts of support for study and research
- Need for types of employment positions in systematic biology
- Faculty vacancies in biology and in systematic biology
- Probable areas of faculty hiring, and reason for hiring in that area

All 168 doctorate-granting institutions in the United States were surveyed. There were 108 public and 60 private institutions; 41 institutions that ranked in the top 50 nationwide for agriculture research and development (R&D) dollars; 45 that ranked in the top 50 nationwide for biology R&D dollars; and 97 land grant institutions. The response rate for the survey was 96 percent. Statistics reported are population estimates and refer to the 108

institutions that reported that they *currently* train graduate students in systematic biology.

Currently there are 940 systematic biology faculty (700 full time and 240 adjunct), 1,154 systematic biology graduate students, 171 postdoctoral fellows, and 324 systematic biology support personnel, distributed among 220 departments. About half of the institutions train systematic biology graduate students in one department only; another quarter train in two departments. Almost one-third of the departments that train systematic biologists are biology departments.

Faculty Vacancies in Systematic Biology

Ninety-two institutions (85 percent of those training) reported from 1 to 15 unfilled, but budgeted positions in their biology program, for a total of 314 vacancies. Of the schools with biology vacancies, 40 had from 1 to 4 vacancies in the systematics area, for a total of 55 (or 18 percent of all biology vacancies). These 40 institutions represent 43 percent of institutions with biology program vacancies, and 37 percent of all institutions that provide training in systemic biology.

If biology program expansion were likely, most institutions (42 percent) would hire in the *molecular* area. Twenty institutions (18 percent) would hire in the *systematics* area. Of the institutions that would expand their systematics programs, 74 percent (14 institutions) currently have no systematics vacancies. Half, or 10, of these institutions would devote a new position to systematics because of positions lost to *faculty retirements or departures*. In contrast, institutions that would choose to expand their molecular programs would do so mostly because of *changes in department emphasis* (40 percent), or *greater opportunities for funding* in this area (30 percent).

Training of Students from Developing Countries

The survey requested subtotals by developing country origin of students. Overall, about 10 percent each of systematic biology graduate students and postdoctoral fellows are from developing countries. Ten percent of the Master's degrees and 7 percent of the Ph.D. degrees awarded in 1987-88 went to non-U.S. citizens and 6 percent of Master's degrees and 5 percent of Ph.D. degrees went to students from developing countries.

Major Disciplinary Approach of Faculty and Those in Training

For faculty research, 41 percent of institutions reported that the major disciplinary approach was *phylogenetic analysis*; 20 percent reported *floristic and faunistic surveys*; 16 percent, *taxonomic revisions*; 13 percent, *surveys of particular groups*; and 10 percent could not report a single approach. For postdoctoral research, 25 percent of institutions reported that the major disciplinary approach was *phylogenetic analysis*; 7 percent, *surveys of particular groups*; 6 percent, *floristic and faunistic surveys*; 4 percent, *taxonomic revisions*; and 57 percent could not report a single approach. For graduate student training, 41 percent of institutions reported that the major

disciplinary approach was *phylogenetic analysis*; 24 percent, *floristic and faunistic surveys*; 18 percent, *taxonomic revisions*; 10 percent, *surveys of particular groups*; and 7 percent, no single approach.

Faculty, graduate students, and postdoctoral fellows whose major disciplinary approach is *floristic and faunistic surveys* each use the methods or techniques from *ecology* and *morphology* most often. Faculty and graduate students whose major disciplinary approach is *phylogenetic analysis* use the methods or techniques from *evolution* and *morphology* most often, while postdoctoral fellows use those from *morphology* and *molecular biology*.

Faculty whose major disciplinary approach is *surveys of particular groups* use the methods or techniques from *evolution* and *morphology* most often, whereas graduate students use those from *ecology* and *morphology*, and postdoctoral fellows use those from *ecology* and *evolution*. Faculty and postdoctoral fellows whose major disciplinary approach is *taxonomic revisions* each use *biogeography* and *morphology* most often, but graduate students use those from *ecology* and *morphology*.

Introduction

In October of 1987 the National Science Board established the Task Force on Global Biodiversity to study the decline in global biological diversity.[1] The decline in global biological diversity is a decrease in the variety and variability among living things and ecosystems, characterized by the extinction of species or the loss of variety in species' gene-pools and the degradation of ecosystems, either in a limited geographic area or globally. The decline is being caused primarily by human activity and has been observed in many parts of the world. The mission of the Task Force is to develop a course of action for the National Science Foundation to follow to promote responsible management (preservation and maintenance) of global biological diversity.

Systematic biologists -- scientists who identify, document, and classify living things -- play a critical role in the management of global biological diversity, since the scientific community needs the biotic inventories and classifications they produce in order to understand biotic diversity and to monitor changes. The inventories available are far from complete. Only a small fraction of the species currently thought to exist on earth have been identified, and an even smaller fraction of species inhabiting the most threatened, yet species-rich, tropical areas have been identified. These gaps in our knowledge will hamper efforts to monitor and manage change; as a result, many species may become extinct or evacuate areas they now inhabit before they have been identified and observed. Further, since the decline in global biological diversity appears to be accelerating, the extinction of unidentified species will become a greater problem in the future.

The need for immediate action is great, but there are too few scientists currently practicing systematic biology to complete the exhaustive inventories needed, and too few are being trained for the future. The Task Force requested that a Higher Education Surveys (HES) study be conducted to gather information on systematic biology training and personnel in order to gauge the magnitude and severity of these human resource shortfalls and to develop effective strategies to overcome them. Past studies of systematic biologists include "The Systematics Community," the 1985 report of the Association of Systematics Collections that surveyed individual systematists at all levels and in all occupations. The survey conducted by HES gathered information on the number of students currently training to become systematic biologists, especially on how many are from developing countries, where the problems tend to be more severe and the need for management greater. Information on the faculty makeup of departments training these students was also collected.

The HES survey collected detailed information from institutions involved in training graduate students in systematic biology during the 1988-89 academic year (the questionnaire is reprinted in Appendix C). For the purposes of the survey, systematic biology was defined as "...the discipline that treats biological diversity at the organismal and population levels with special reference to the

[1] Information on biodiversity is from the Task Force Report, Loss of Biological Diversity: A Global Crisis Requiring International Solutions, NSF-89-122.

classification, evolution, and distribution of particular groups of organisms. Excluded are comparative studies in anatomy, behavior, biochemistry, and the like unless they are directed principally toward classification and phylogeny."

From institutions with graduate-level systematic biology programs, the survey requested information about the following:

- Departments training graduate students in systematic biology, and department composition
- Numbers of graduate students, postdoctoral fellows, faculty members, and degree recipients in systematic biology
- Distribution of personnel by minority group membership, citizenship, and developing country status
- Major disciplinary approach within systematic biology
- Sources and amounts of support for study and research
- Need for types of employment positions in systematic biology
- Faculty vacancies in biology and in systematic biology
- Probable areas of faculty hiring, and reason for hiring in that area

Questionnaires were mailed either to HES coordinators or directly to faculty contacts at all 168 doctorate-granting institutions[2] in the United States in the winter of 1988-89. Members of the Task Force identified faculty members to serve as respondents at about half of the institutions. Respondents for the other schools were selected by the institutions' HES coordinators, who, provided with information on survey content, decided on the most appropriate survey respondent for their institution.

Ninety-six percent (161 institutions) responded to the survey (Appendix B lists the respondent institutions). Results reported contain a nonresponse adjustment.[3] The population of institutions surveyed was 108 public and 60 private institutions. Forty-one of the institutions surveyed ranked in the top 50 institutions nationwide for research and development (R&D) dollars acquired

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[2] Doctorate-granting institutions are characterized by a significant level of activity in and commitment to doctoral-level education as measured by the number of doctorate recipients and the diversity in doctorate program offerings. Included in this category are institutions that are not considered specialized schools and that grant a minimum of 30 doctoral-level degrees per year. These degrees must be granted in three or more doctoral-level program areas or have an interdisciplinary program at the doctorate level. Included in the counts of doctorate degrees are the first professional medical degrees.

[3] To account for the 4 percent of schools that did not respond to the survey the 57 private school responses were each multiplied by 1.05 to represent the 60 schools in that population, and the 104 public school responses were each multiplied by 1.04 to represent the 108 schools in that population.

in agriculture for 1986, 45 ranked in the top 50 institutions nationwide for R&D dollars acquired in biology in 1986, and 97 are land grant institutions. Of the respondent institutions, 64 percent (108 institutions) currently train graduate students in systematic biology (Appendix Table A-1). Institutions not involved in training skipped the remainder of the questionnaire once this fact was determined; statistics reported here are only for institutions *currently* training graduate students in systematic biology. Complete coverage of departments within these institutions was dependent upon the efforts of the institutional respondents. Respondents were instructed to report for the institution as a whole, and to include information from all relevant departments. Nonetheless, several surveys were returned stating that the information contained in them was incomplete or was reported for one department only. Subsequent data retrieval by Westat resulted in complete information for all but one of these surveys. The remaining incomplete survey was treated as a nonresponse, and the data from it were not used in the analysis.

The report itself is organized by survey topic from the questionnaire. Appendix A contains detailed tables, Appendix B contains technical notes on the HES system and survey methodology, and Appendix C contains the questionnaire used in data collection.

Distribution of Systematic Biology Departments

In almost 90 percent of the 108 institutions that currently train graduate students in systematic biology, training occurs through the College of Arts and Sciences; in 26 percent, through the College of Agriculture, Forestry, or Natural Resources; and in 18 percent, through some other administrative unit (Appendix Table A-2).[4]

The 108 institutions train systematic biology students in a total of 220 departments. Almost half train in one department only and another quarter train in two departments (Figure 1). Almost one-third of training departments are biology departments, and about 10 percent each are botany, zoology, entomology, and geology departments (Figure 2; Appendix Tables A-3, A-4, and A-5).

Current Systematic Biology Faculty and Those in Training

There are currently 940 systematic biology faculty involved in systematic biology training and research at doctorate-granting schools. Of these faculty, 700 are full-time and 240 are adjunct (those who do not have full-time appointments, including those who primarily work in other facilities such as museums and agricultural experiment stations). In all, 324 systematic biology support personnel were reported (Figure 3; Appendix Table A-3).

[4] Percents add to more than 100 because respondents could indicate more than one administrative unit.

Figure 1. Percentage of institutions that currently train graduate students in systematic biology in one, two, three, four, five, and six or more departments

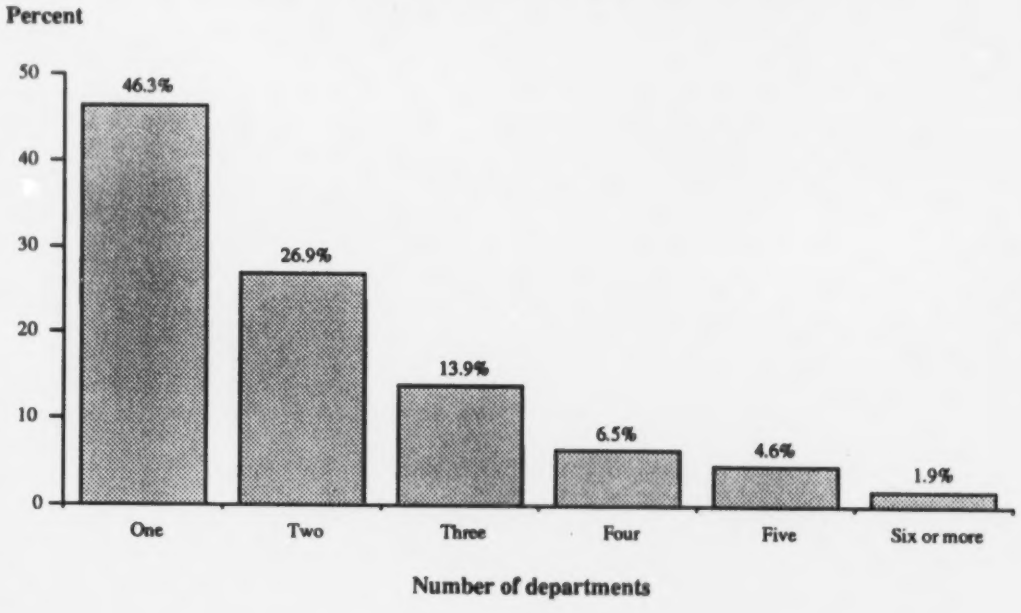


Figure 2. Percentage of systematic biology training provided in top five departments

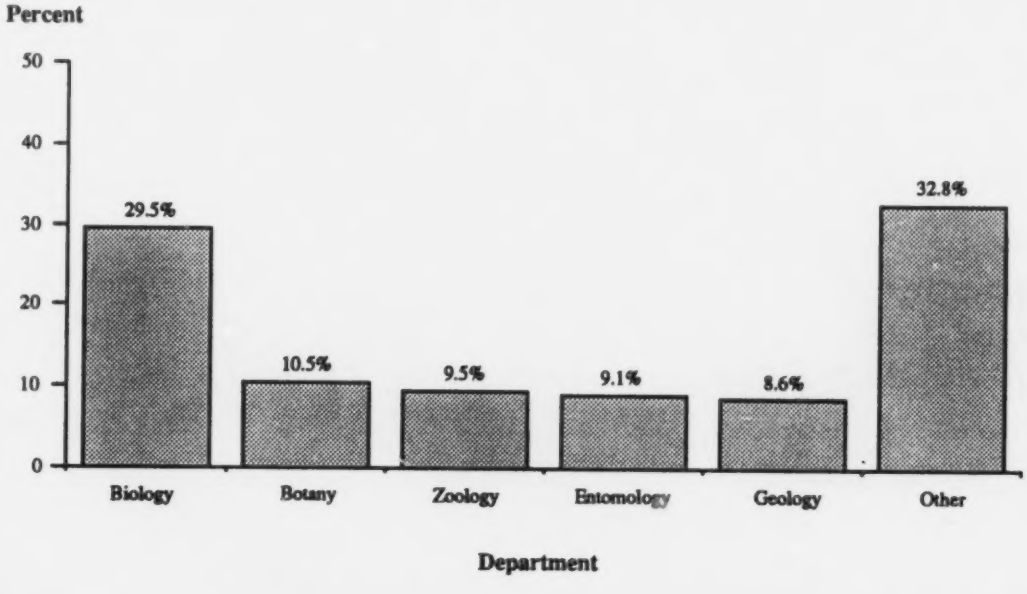


Figure 3. Total numbers of faculty, postdoctoral fellows, graduate students and support personnel in systematic biology

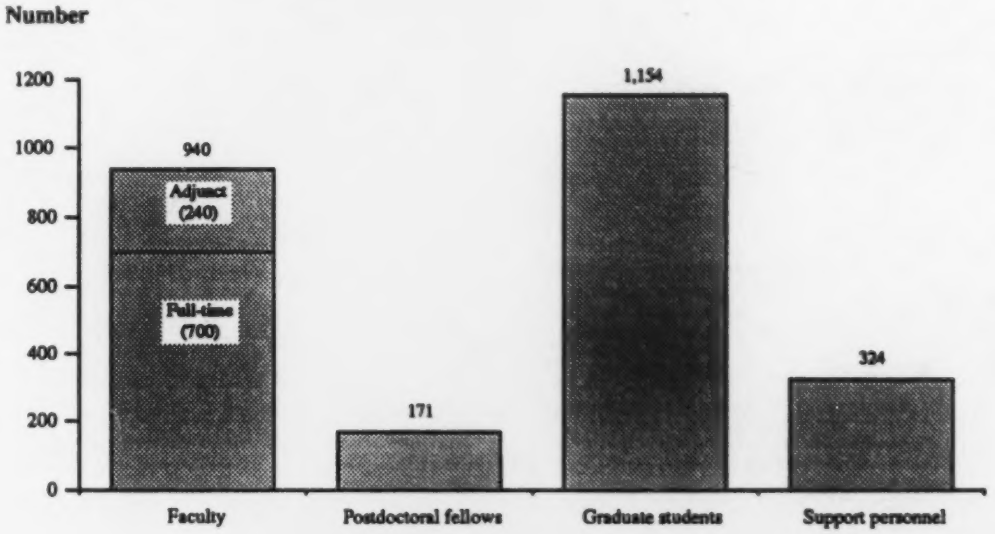


Figure 4. Percentage of systematic biology faculty in top six departments

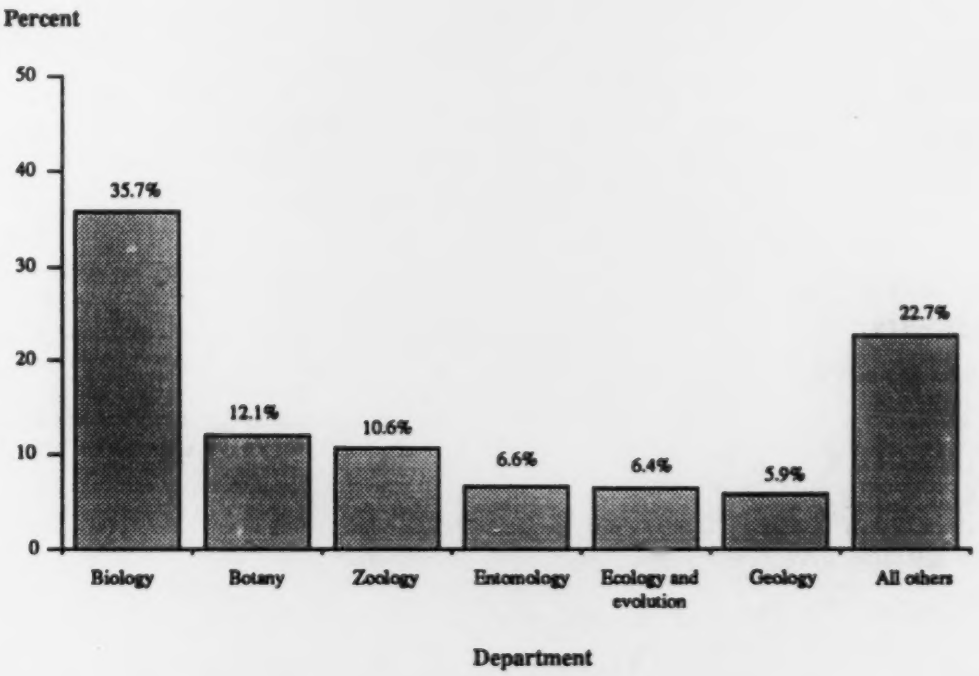
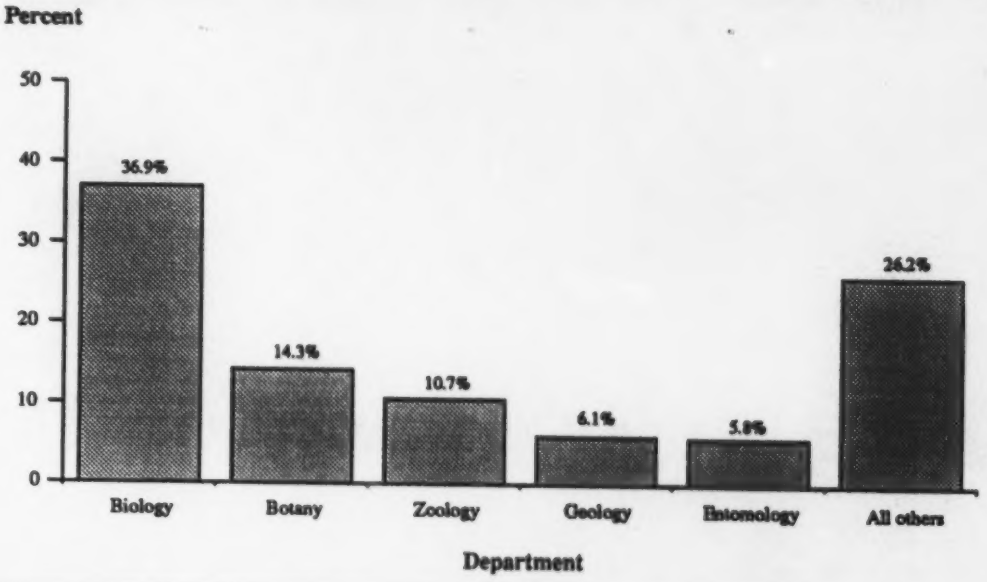


Figure 5. Percentage of systematic biology graduate students in top five departments



By department, 36 percent of the full-time systematic biology faculty are in biology, 12 percent in botany, 11 percent in zoology, and about 6 percent each are in entomology, ecology and evolution, and geology (Figure 4; Appendix Table A-7).

In the 1988-89 school year, the 108 schools were training 1,154 graduate students and 171 postdoctoral fellows.[5] By department, 37 percent of the graduate students were in biology, 14 percent in botany, 11 percent in zoology, and about 6 percent each in geology and entomology (Figure 5; Appendix Tables A-3 and A-6).

During the 1987-88 school year, 151 Ph.D. degrees and 152 Master's degrees in systematic biology were awarded by these institutions (Appendix Table A-8).

Minority Group Membership, Citizenship, and Developing Country Status

The survey requested subtotals by minority group membership[6] (U.S. citizens and permanent residents only), and developing country status.[7] Currently, only 1 percent of systematic biology full-time faculty, 2 percent of postdoctoral fellows, and 5 percent of graduate students are minority group members. Further, only 5 percent of the Master's degrees awarded and 3 percent of the Ph.D. degrees awarded in 1987-88 went to minorities (Appendix Table A-8).

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[5] While it was the intent of the surveys to include only students majoring in systematic biology, some respondents may have also included nonmajors taking systematic biology courses.

[6] Minority racial/ethnic groups are as follows: American Indian/Alaska native, Asian or Pacific Islander, black, or Hispanic.

[7] Developing countries are as follows: Countries in Latin America and the Caribbean, the Far East (excluding Japan), South Asia (including India, Afghanistan, Bangladesh, Pakistan and Sri Lanka), Africa (excluding South Africa), and those in the Near and Middle East (including Turkey, Iran, Saudi Arabia, Lebanon, Jordan and Syria).

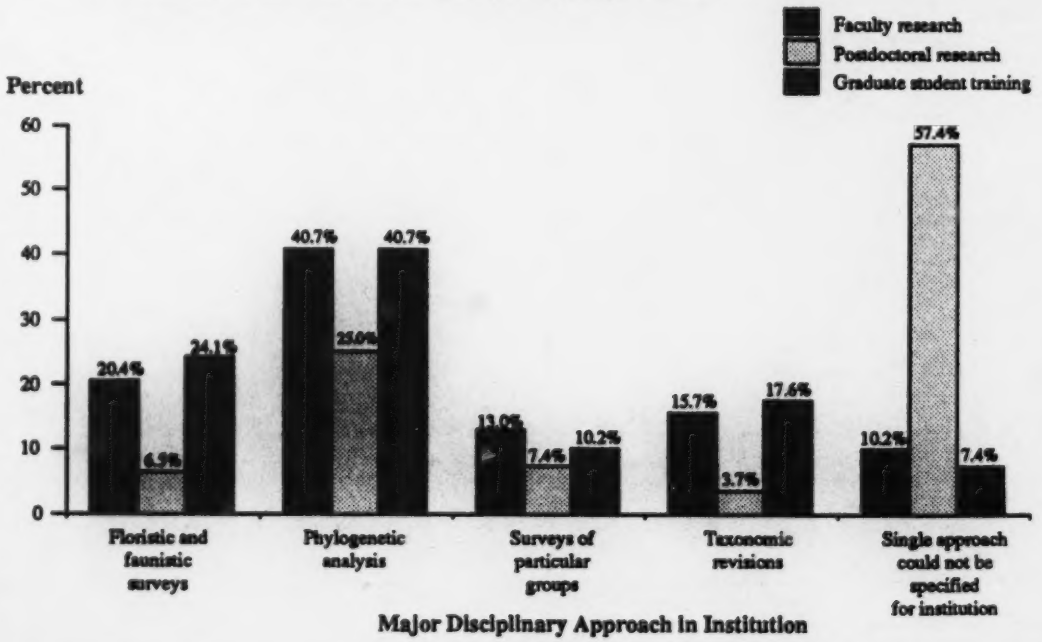
Overall, about 14 percent of systematic biology graduate students and 17 percent of postdoctoral fellows are non-U.S. citizens. Of non-U.S. citizens, 73 percent of graduate students (or 10 percent of all) and 59 percent of postdoctoral fellows (or 10 percent of all) are from developing countries. Ten percent of all Master's degrees and 7 percent of all Ph.D. degrees awarded in 1987-88 went to non-U.S. citizens, and 6 percent of Master's degrees and 5 percent of Ph.D. degrees went to students from developing countries (Table A-8).

Major Disciplinary Approach of Faculty and Those in Training

Survey respondents were asked to characterize broadly the major disciplinary approaches used by faculty, postdoctorates, and graduate students in their systematics programs from the following choices: *floristic and faunistic surveys*, *phylogenetic analysis*, *surveys of particular groups*, and *taxonomic revisions*. They were then asked to identify the two main areas of study from which the methods or techniques these groups use to conduct their research are drawn. To collect this information, respondents were presented with a list of these 10 subdisciplines: *behavior*, *biogeography*, *ecology*, *evolution*, *genetics*, *morphology*, *biochemistry*, *cell biology*, *developmental biology*, and *molecular biology*. Responses are, therefore, the judgments of the survey respondents.

For faculty research, 41 percent of institutions reported a major disciplinary approach of *phylogenetic analysis*, 20 percent, *floristic and faunistic surveys*; 16 percent, *taxonomic revisions*; 13 percent, *surveys of particular groups*; and 10 percent, too great a variety to select a single approach.

Figure 6. Percentage of faculty research, postdoctoral research, and graduate student training in the four major disciplinary approaches



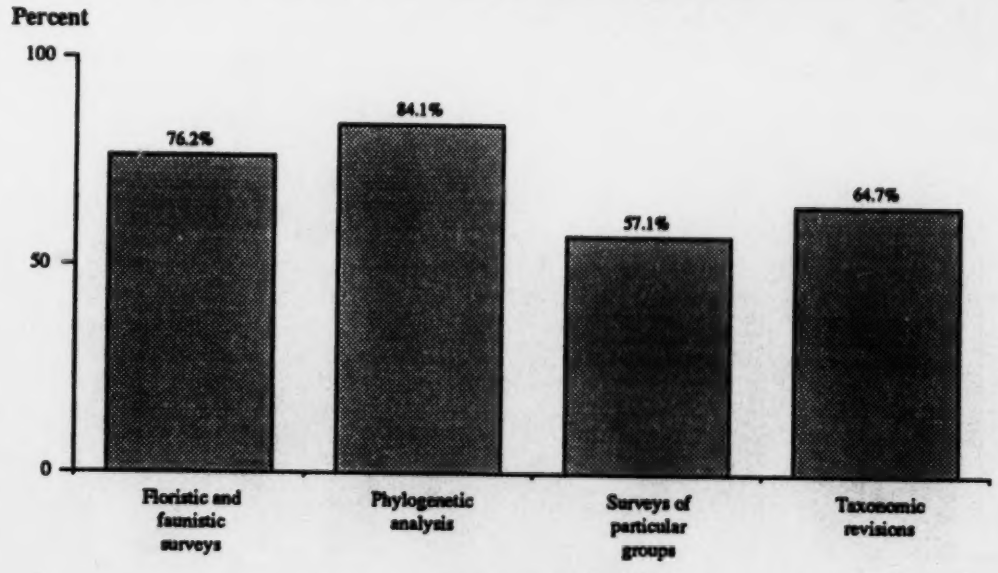
For postdoctoral research, 25 percent of institutions reported a major disciplinary approach of *phylogenetic analysis*; 7 percent, *surveys of particular groups*, 6 percent, *floristic and faunistic surveys*; 4 percent, *taxonomic revisions*; and 57 percent, too great a variety to select a single approach.

For graduate student training, 41 percent of institutions reported a major disciplinary approach of *phylogenetic analysis*; 24 percent, *floristic and faunistic surveys*; 18 percent, *taxonomic revisions*; 10 percent *surveys of particular groups*; and 7 percent, too great a variety to select a single approach (Figure 6; Appendix Tables A-9, A-10, and A-11).

Among institutions where the major disciplinary approach of faculty research is *floristic and faunistic surveys*, 76 percent also have a graduate student emphasis in this approach; where the faculty approach is *phylogenetic analysis*, the student approach is the same 84 percent of the time; where the faculty approach is *surveys of particular groups*, the student approach matches 57 percent of the time; and where the faculty approach is *taxonomic revisions*, the student approach is the same 65 percent of the time (Figure 7; Appendix Table A-12).

Faculty, graduate students, and postdoctoral fellows whose major disciplinary approach is *floristic and faunistic surveys* each use the methods or techniques from *ecology* and *morphology* more often than those from other fields (Figure 8).[8] Faculty and graduate students

Figure 7. Percentage of institutions where graduate students use the same major disciplinary approach as faculty, by faculty approach



[8] Respondents were asked to indicate two fields.

Figure 8. Top two fields from which the methods or techniques used for floristic and faunistic surveys are drawn

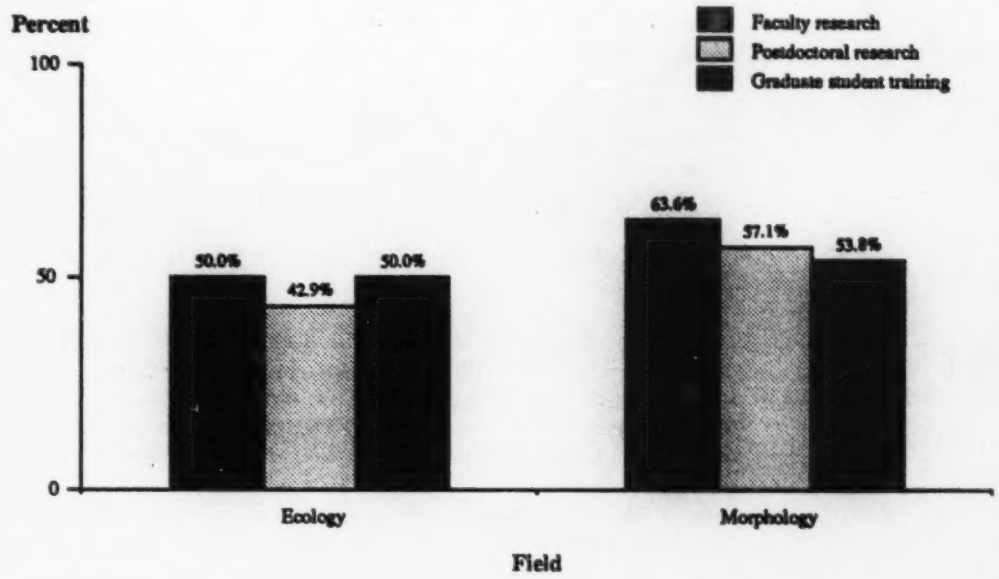
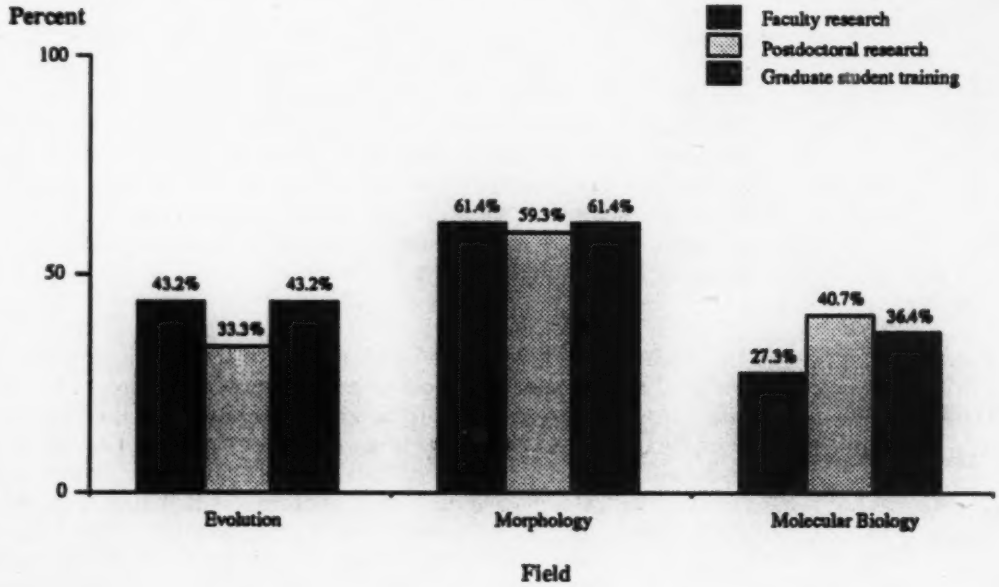


Figure 9. Top three fields from which the methods or techniques used for phylogenetic analysis are drawn



whose major disciplinary approach is *phylogenetic analysis* use the methods from *evolution* and *morphology* most often, although postdoctoral fellows use those from *morphology* and *molecular biology* (Figure 9). Faculty whose major disciplinary approach is *surveys of particular groups* use the methods from *evolution* and *morphology* more often than those from other fields, whereas graduate students use those from *ecology* and *morphology* most often, and postdoctoral fellows use those from *ecology* and *evolution* (Figure 10). Faculty and postdoctoral fellows whose major disciplinary approach is *taxonomic revisions* each use methods from *biogeography* and *morphology* more often, but graduate students use those from *ecology* and *morphology* (Figure 11; Appendix Tables A-9, A-10, and A-11).

Faculty Vacancies in Systematic Biology

A series of questions explored faculty vacancies in biology programs and probable areas for biology program expansion. Institutions with graduate systematic biology programs were asked for the number of full-time faculty vacancies (unfilled, but budgeted positions) in all biology programs, and then specifically the number in systematic biology. They were also asked from which of six fields their institution would be likely to hire if given an additional full-time faculty position, and to give a reason for their choice.

Ninety-two institutions (85 percent) reported from 1 to 15 biology program vacancies, for a total of 314 vacancies. Of the schools with biology vacancies, 40 had from 1 to 4 vacancies in the systematics area, for a total of 55 (or 18 percent of all biology vacancies). These 40 institutions represent 43 percent of institutions with biology program vacancies, and 37 percent of all training institutions.

If biology program expansion were likely, most institutions (42 percent) would hire in the *molecular* area. Twenty institutions (18 percent) would hire in the *systematics* area. Of the institutions that would expand their systematics programs, 74 percent (14 institutions) currently have no systematics vacancies. Also, half of these (10 institutions) would devote a new position to systematics because of positions lost to *faculty retirements or departures*. In contrast, institutions that would choose to expand their molecular programs would do so mostly because of *changes in department emphasis* (40 percent), or *greater opportunities for funding* in this area (30 percent) (Figures 12 and 13; Appendix Table A-13).

Need for Additional Systematic Biology Positions

In order to discover which major disciplinary approaches systematists perceive are most in need of new positions, the survey asked respondents to select, for each of five positions, the two major disciplinary approaches they saw as most in need. The positions discussed were: postdoctoral trainee or associate, tenure-track faculty, doctoral-level industrial,[9] doctoral-level Federal or state government, and nondoctoral research associate. Respondents could choose two major disciplinary approaches from among *floristic and faunistic surveys*, *phylogenetic analysis*, *surveys of particular groups*, and *taxonomic revisions*, for each position listed.

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[9] For example, positions in agribusiness or biotechnology.

Figure 10. Top three fields from which the methods or techniques used for surveys of particular groups are drawn

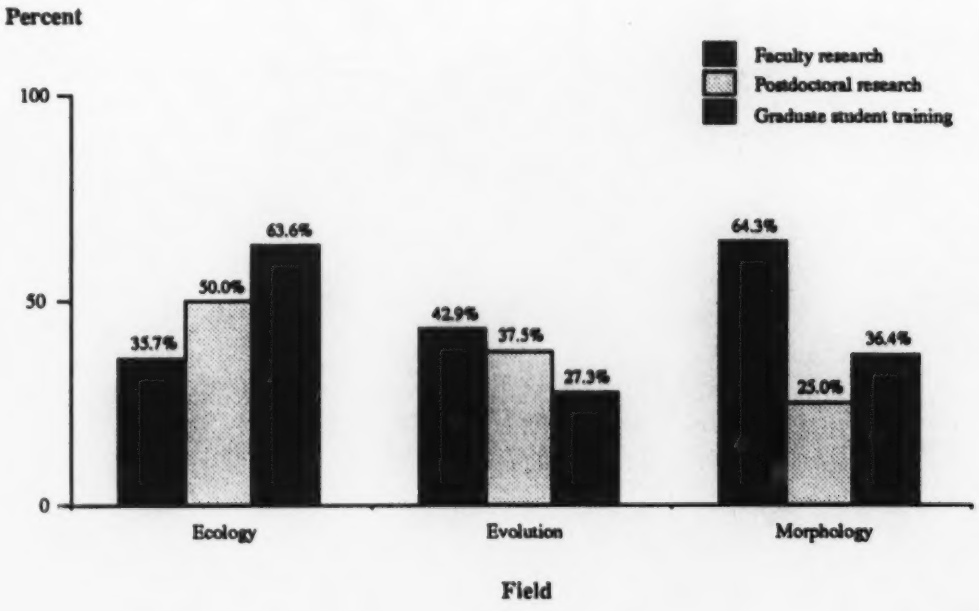


Figure 11. Top three fields from which the methods or techniques used for taxonomic revisions are drawn

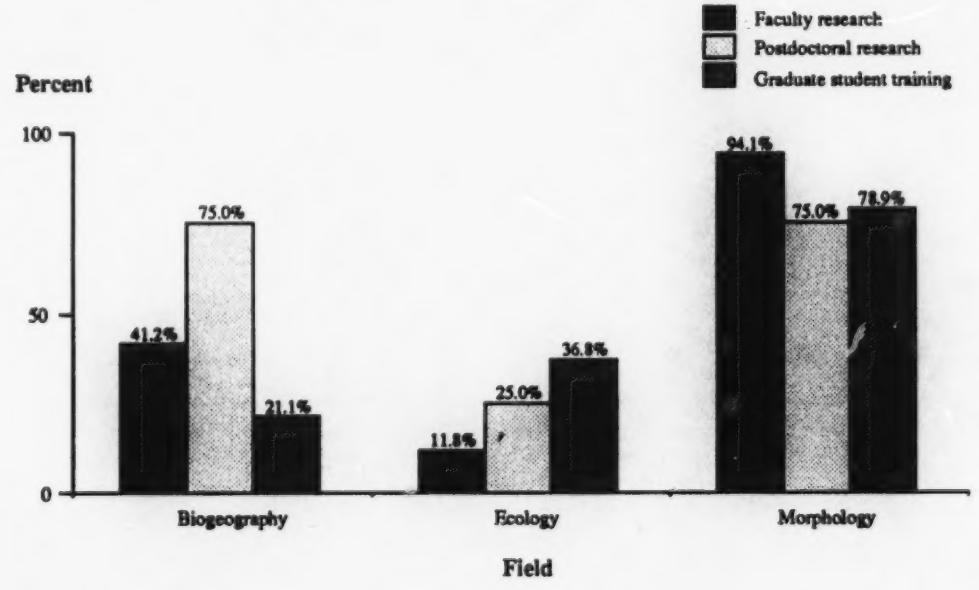


Figure 12. Probable areas of biology program expansion

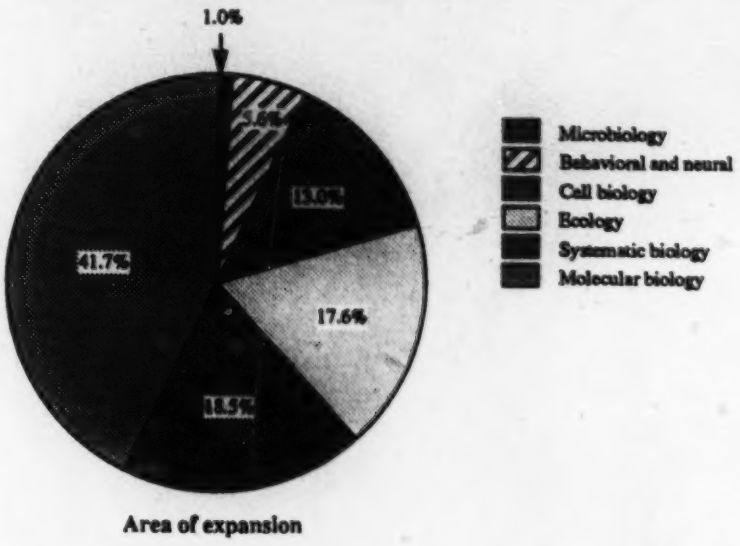


Figure 13. Reason for expansion among those who would expand systematic biology or molecular biology

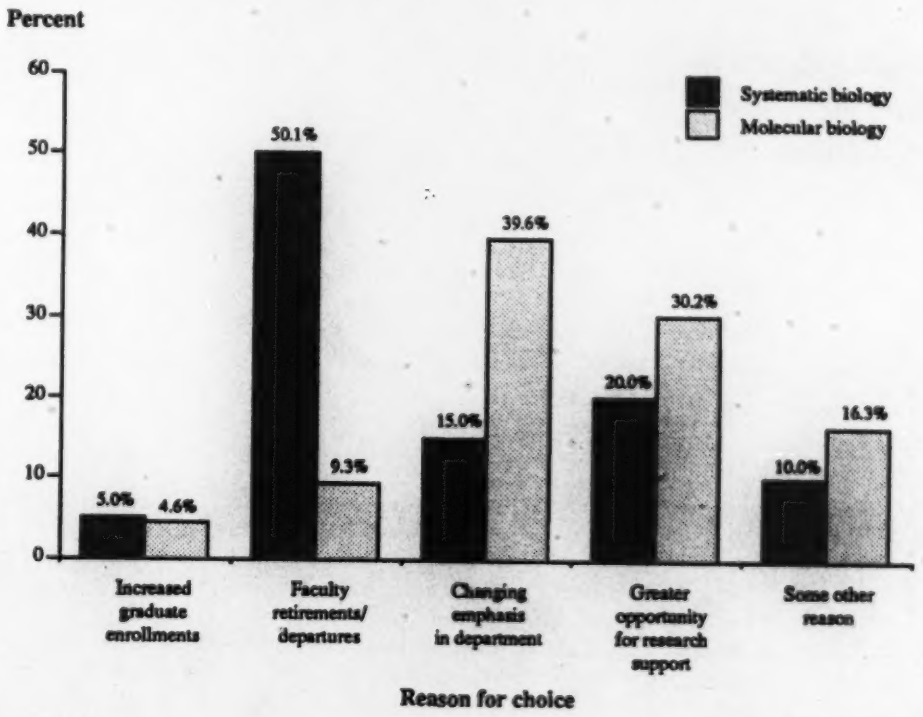
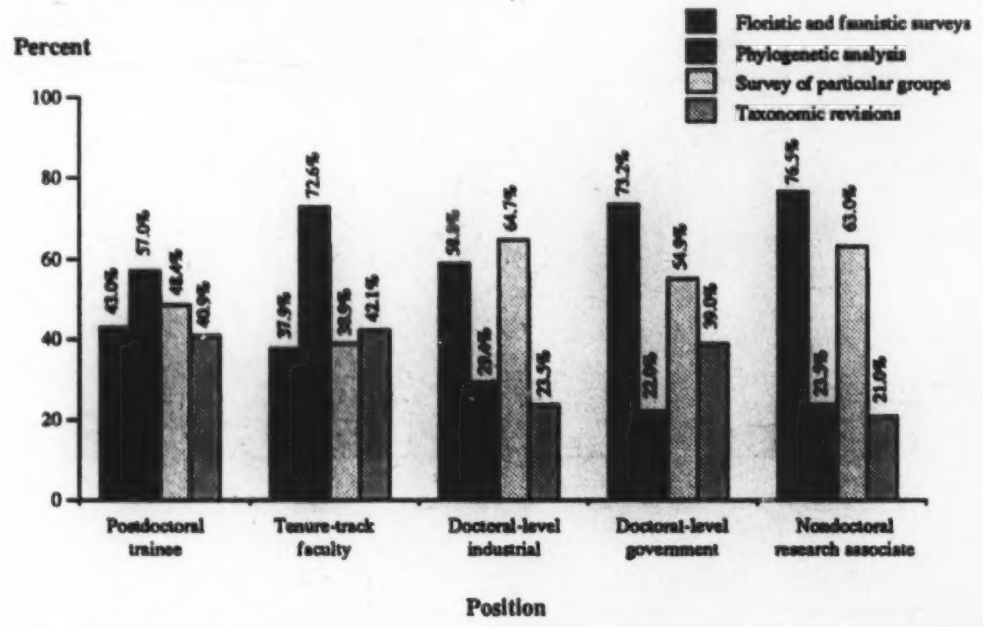


Figure 14. Perceived need for systematic biology positions in major disciplinary approaches



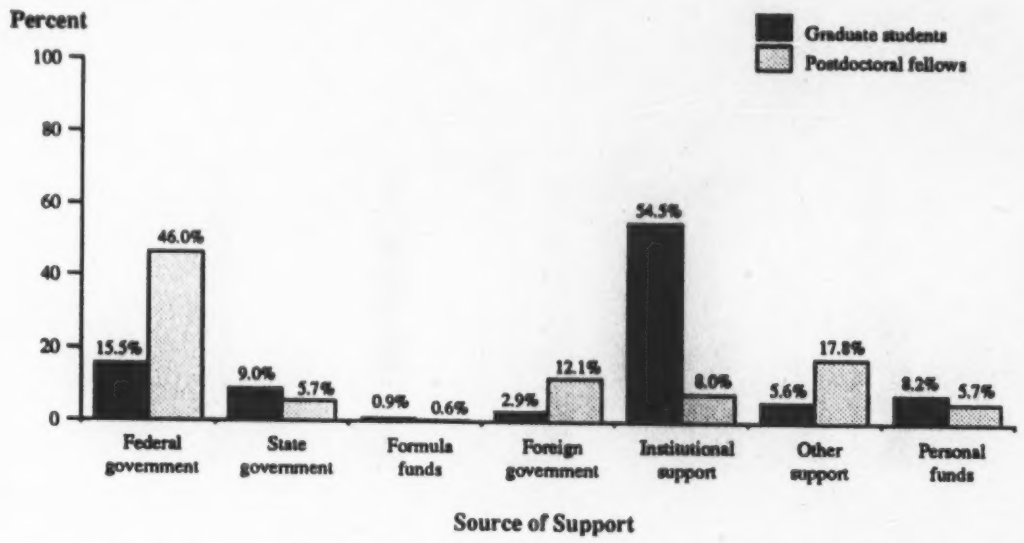
Fifty-seven percent of institutions cited *phylogenetic analysis* as the major disciplinary approach for which additional postdoctoral positions should be created, and 73 percent of institutions cited this major disciplinary approach as the one for which additional tenure-track faculty positions should be created.

Sixty-five percent of institutions cited *surveys of particular groups* as the major disciplinary approach for which additional doctoral-level industrial positions should be created, and 59 percent cited *floristic and faunistic surveys*. Seventy-three percent of institutions cited *floristic and faunistic surveys* as the major disciplinary approach for which additional doctoral-level governmental positions should be created, and 76 percent of institutions cited this major disciplinary approach as the one for which additional research associate positions should be created (Figure 14; Appendix Table A-14).

Sources of Support for Systematic Biologists in Training

Respondents were asked to classify their systematic biology graduate students and postdoctoral fellows by their major source of support. About half (54 percent) of graduate students are supported mainly through institutional support, about 15 percent Federal support (12 percent Federal research grants and 3 percent Federal fellowships). Other sources include 9 percent supported mainly through state fellowships and grants, and 8 percent supported by personal funds (Figure 15; Appendix Table A-15).

Figure 15. Sources of support for systematic biology graduate students and postdoctoral fellows



Sources of support for postdoctoral fellows include 46 percent mainly through Federal support (37 percent Federal research grants and 9 percent Federal fellowships), 12 percent supported mainly by foreign governments, and 8 percent institutional support (Appendix Table A-16).

Research Support for Systematic Biology and Sources of Support

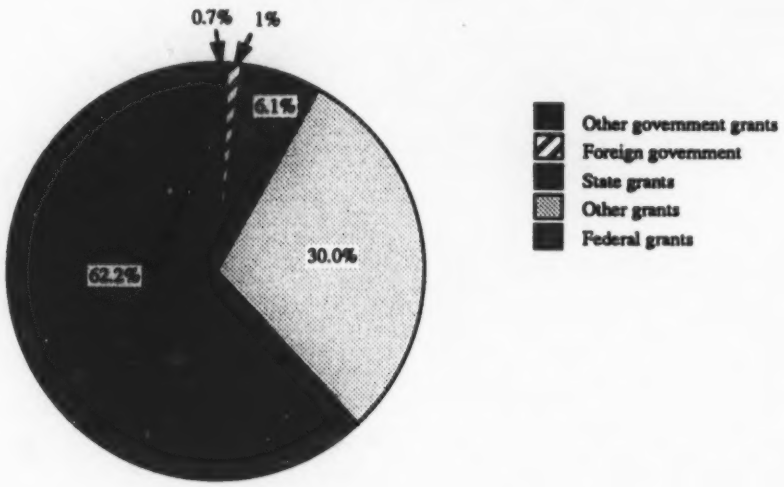
Of the $35.5 million in research grants for systematic biology received in 1987-88, 62 percent comes from the Federal government, 6 percent comes from State governments, about 1 percent from foreign governments, and 30 percent from non-government grants (Figure 16; Appendix Table A-18).

Major Differences Between Types of Institutions

There are differences in institutions' propensity to train systematic biology graduate students.

- About 80 percent of public institutions train, versus only 37 percent of private institutions
- Over 90 percent of the top 50 schools in agriculture R&D train, versus only 56 percent of those not in the top 50

Figure 16. Sources of grants for systematic biology research received in 1987-88



- About 69 percent of the top 50 schools in biology R&D train, versus 63 percent of those not in the top 50[10]
- Over 80 percent of land grant schools train systematic biologists, versus 40 percent of non-land grant schools (Appendix Table A-1).[11]

The institutions in our population that are in the top 50 for agriculture R&D, those that are in the top 50 schools for biology R&D, and the land grant schools share the following characteristics:

- They tend to train systematic biologists in a greater variety of departments than the other types of schools (Appendix Table A-4)
- They have greater than expected numbers of graduate students, postdoctoral fellows, faculty, and support personnel (Appendix Table A-3)
- They awarded a greater than expected number of Ph.D. degrees (Appendix Table A-8).

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[10] Rankings are from NSF publication 89-311, Academic Science/Engineering: R&D Funds, Fiscal Year 1987, Tables, which reports R&D expenditures for agriculture and biology.

[11] Land grant designation is from the National Association of State Universities and Land-Grant Colleges, Fact Book, Washington, D.C., 1988.

APPENDIX A

Detailed Tables

Table A-1. Institutions by systematic biology training status and selected institutional characteristics: 1988-89 academic year

Selected institutional characteristic	Institutions training graduate students		Institutions not training graduate students		Total institutions	
	Number	Percent	Number	Percent	Number	Percent
Total institutions	108	64.3	60	35.7	168	100
Public institutions	86	79.6	22	20.4	108	100
Private institutions	22	36.7	38	63.3	60	100
Top 50 agriculture R&D*	37	90.2	4	9.8	41	100
Not top 50 agriculture R&D	71	55.9	56	44.1	127	100
Top 50 biology R&D*	31	68.9	14	31.1	45	100
Not top 50 biology R&D	77	62.6	46	37.4	123	100
Land grant institutions	79	81.4	18	18.6	97	100
Non-land grant institutions	29	40.8	42	59.2	71	100

*Rankings are from Academic Science/Engineering: R&D Funds, Fiscal Year 1987, Tables, NSF publication 89-311.

SOURCE: Higher Education Surveys, Systematic Biology Training and Personnel (HES 10), National Science Foundation, 1990.

Table A-2. Institutions that train graduate students in systematic biology by divisions and/or colleges that are the primary focus for training and selected institutional characteristics: 1988-89 academic year[1]

Selected institutional characteristic	Division/college					
	Arts and Sciences or Sciences		Agriculture, Forestry, Natural Resources		Other	
	Number	Percent	Number	Percent	Number	Percent
Total institutions	97	89.8	28	25.9	20	18.5
Public institutions	78	90.7	26	30.2	14	16.3
Private institutions	19	86.4	2	9.1	6	27.3
Top 50 agriculture R&D[2]	36	97.3	23	62.2	4	10.8
Top 50 biology R&D[2]	29	93.5	10	32.3	6	19.4
Land grant institutions	72	91.1	26	32.9	14	17.7

[1]Percents across rows will not total to 100 because respondents could indicate more than one administrative unit.

[2]Rankings are from Academic Science/Engineering: R&D Funds, Fiscal Year 1987, Tables, NSF publication 89-311.

SOURCE: Higher Education Surveys, Systematic Biology Training and Personnel (HES 10), National Science Foundation, 1990.

Table A-3. Systematic biology departments, graduate students, postdoctoral fellows, total, full-time and adjunct faculty, and support personnel by selected institutional characteristics: 1988-89 academic year

Category	Selected institutional characteristic											
	All training institutions (N=108)		Public institutions (N=86)		Private institutions (N=22)		Institutions in top 50 R&D: agriculture* (N=37)		Institutions in top 50 R&D: biology* (N=31)		Land grant institutions (N=79)	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Departments	220	100	183	83.2	37	16.8	105	47.7	75	34.1	178	80.9
Graduate students	1,154	100	947	82.1	207	17.9	445	38.6	397	34.4	884	76.6
Postdoctoral fellows	171	100	132	77.2	39	22.8	62	36.3	71	41.5	135	78.9
Total faculty	940	100	768	81.7	172	18.3	345	36.7	318	33.8	731	77.8
Full-time	700	100	580	82.9	120	17.1	275	39.3	242	34.6	553	79.0
Adjunct	240	100	188	78.3	52	21.7	70	29.2	76	31.7	178	74.2
Support personnel	324	100	251	77.5	73	22.5	149	46.0	124	38.3	259	79.9

*Rankings are from Academic Science/Engineering: R&D Funds, Fiscal Year 1987, Tables, NSF publication 89-311.

SOURCE: Higher Education Surveys, Systematic Biology Training and Personnel (HES 10), National Science Foundation, 1990.

Table A-4. Institutions that train graduate students in systematic biology by number of departments that train and selected institutional characteristics: 1988-89 academic year

Number of departments	Selected institutional characteristic											
	All training institutions (N=108)		Public institutions (N=86)		Private institutions (N=22)		Institutions in top 50 R&D: agriculture* (N=37)		Institutions in top 50 R&D: biology* (N=31)		Land grant institutions (N=79)	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total institutions	108	100.0	85	100.0	22	100.0	36	100.0	30	100.0	78	100.0
One department	50	46.3	37	43.5	13	59.1	9	25.0	11	36.7	29	37.2
Two departments	29	26.9	24	28.2	5	22.7	9	25.0	5	16.7	24	30.8
Three departments	15	13.9	12	14.1	2	9.1	6	16.7	6	20.0	12	15.4
Four departments	7	6.5	5	5.9	2	9.1	5	13.9	5	16.7	6	7.7
Five departments	5	4.6	5	5.9	0	0.0	5	13.9	3	10.0	5	6.4
Six or more departments	2	1.9	2	2.4	0	0.0	2	5.6	0	0.0	2	2.6

*Rankings are from Academic Science/Engineering: R&D Funds, Fiscal Year 1987, Tables, NSF publication 89-311.

SOURCE: Higher Education Surveys, Systematic Biology Training and Personnel (HES 10), National Science Foundation, 1990.

Table A-5. Departments that currently train graduate students in systematic biology by name and selected institutional characteristics: 1988-89 academic year

Department name	Selected institutional characteristic											
	All training institutions (N=108)		Public institutions (N=86)		Private institutions (N=22)		Institutions in top 50 R&D: agriculture* (N=37)		Institutions in top 50 R&D: biology* (N=31)		Land grant institutions (N=79)	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total departments ...	220	100.0	183	100.0	37	100.0	105	100.0	75	100.0	178	100.0
Biology	65	29.5	48	26.2	17	45.9	14	13.3	15	20.0	39	21.9
Botany	23	10.5	23	12.6	0	0.0	14	13.3	9	12.0	23	12.9
Zoology	21	9.5	19	10.4	2	5.4	11	10.5	6	8.0	19	10.7
Entomology	20	9.1	19	10.4	1	2.7	18	17.1	9	12.0	20	11.2
Geology	19	8.6	15	8.2	4	10.8	6	5.7	7	9.3	15	8.4
Anthropology	9	4.1	6	3.3	3	8.1	3	2.9	3	4.0	6	3.4
Forestry	8	3.6	7	3.8	1	2.7	7	6.7	5	6.7	7	3.9
Ecology & Evolution	6	2.7	6	3.3	0	0.0	2	1.9	3	4.0	6	3.4
Plant Pathology	6	2.7	5	2.7	1	2.7	6	5.7	2	2.7	6	3.4
Anatomy	4	1.8	3	1.6	1	2.7	1	1.0	2	2.7	3	1.7
Fisheries	3	1.4	3	1.6	0	0.0	3	2.9	2	2.7	3	1.7
Horticulture	3	1.4	2	1.1	1	2.7	3	2.9	3	4.0	3	1.7
Oceanography	3	1.4	3	1.6	0	0.0	1	1.0	0	0.0	3	1.7
Botany & Microbiology	2	.9	2	1.1	0	0.0	1	1.0	0	0.0	2	1.1
Botany & Plant Pathology	2	.9	2	1.1	0	0.0	1	1.0	1	1.3	2	1.1
Ecology & Systematics	2	.9	1	.5	1	2.7	1	1.0	1	1.3	2	1.1
Microbiology	2	.9	2	1.1	0	0.0	2	1.9	1	1.3	2	1.1
Plant, Soil & Insect Science	2	.9	2	1.1	0	0.0	2	1.9	1	1.3	2	1.1
Other (N<2)	20	9.1	15	8.2	5	13.5	9	8.6	5	6.7	15	8.4

*Rankings are from Academic Science/Engineering: R&D Funds, Fiscal Year 1987, Tables, NSF publication 89-311.

SOURCE: Higher Education Surveys, Systematic Biology Training and Personnel (HES 10), National Science Foundation, 1990.

Table A-6. Systematic biology graduate students by departmental affiliation and selected institutional characteristics: 1988-89 academic year

Department name	Selected institutional characteristic											
	All training institutions (N=108)		Public institutions (N=86)		Private institutions (N=22)		Institutions in top 50 R&D: agriculture* (N=37)		Institutions in top 50 R&D: biology* (N=31)		Land grant institutions (N=79)	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total graduate students	1,154	100.0	947	100.0	207	100.0	445	100.0	397	100.0	884	100.0
Biology	426	36.9	312	32.9	114	55.1	57	12.8	121	30.5	258	29.2
Botany	165	14.3	165	17.4	0	0.0	94	21.1	62	15.6	145	16.4
Zoology	124	10.7	108	11.4	16	7.7	73	16.4	41	10.3	108	12.2
Geology	70	6.1	56	5.9	14	6.8	14	3.1	33	8.3	56	6.3
Entomology	67	5.8	60	6.3	7	3.4	56	12.6	38	9.6	67	7.6
Ecology & Evolution	45	3.9	45	4.8	0	0.0	19	4.3	21	5.3	45	5.1
Fisheries	40	3.5	40	4.2	0	0.0	40	9.0	12	3.0	39	4.4
Ecology & Systematics	38	3.3	37	3.9	1	.5	1	.2	1	.3	38	4.3
Anthropology	29	2.5	12	1.3	17	8.2	3	.7	17	4.3	12	1.4
Plant Pathology	18	1.6	17	1.8	1	.5	18	4.0	3	.8	18	2.0
Forestry	14	1.2	12	1.3	2	1.0	12	2.7	9	2.3	12	1.4
Anatomy	13	1.1	10	1.1	3	1.4	5	1.1	9	2.3	10	1.1
Horticulture	11	1.0	4	.4	7	3.4	11	2.5	11	2.8	7	.8
Population Biology	10	.9	0	0.0	10	4.8	0	0.0	0	0.0	0	0.0
Natural History	9	.8	9	1.0	0	0.0	9	2.0	0	0.0	9	1.0
Botany & Range Science	8	.7	0	0.0	8	3.9	0	0.0	0	0.0	0	0.0
Genetics	8	.7	8	.8	0	0.0	8	1.8	8	2.0	8	.9
Botany & Microbiology	7	.6	7	.7	0	0.0	1	.2	0	0.0	7	.8
Botany & Plant Pathology	6	.5	6	.6	0	0.0	1	.2	1	.3	6	.7
Oceanography	6	.5	6	.6	0	0.0	1	.2	0	0.0	6	.7
Other (N < 6)	40	3.5	33	3.5	7	3.4	22	4.9	10	2.5	33	3.7

*Rankings are from Academic Science/Engineering: R&D Funds, Fiscal Year 1987, Tables, NSF publication 89-311.

SOURCE: Higher Education Surveys, Systematic Biology Training and Personnel (HES 10), National Science Foundation, 1990.

Table A-7. Full-time faculty engaged in systematic biology training and research by departmental affiliation and selected institutional characteristics: 1988-89 academic year

Department name	Selected institutional characteristic											
	All training institutions (N=108)		Public institutions (N=86)		Private institutions (N=22)		Institutions in top 50 R&D: agriculture* (N=37)		Institutions in top 50 R&D: biology* (N=31)		Land grant institutions (N=79)	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total full-time faculty	700	100.0	580	100.0	120	100.0	275	100.0	242	100.0	553	100.0
Biology	250	35.7	190	32.8	60	50.0	38	13.8	72	29.8	162	29.3
Botany	85	12.1	85	14.7	0	0.0	50	18.2	28	11.6	75	13.6
Zoology	74	10.6	61	10.5	13	10.8	36	13.1	16	6.6	62	11.2
Entomology	46	6.6	42	7.2	4	3.3	39	14.2	25	10.3	46	8.3
Ecology & Evolution	45	6.4	45	7.8	0	0.0	11	4.0	23	9.5	45	8.1
Geology	41	5.9	34	5.9	7	5.8	9	3.3	19	7.9	34	6.1
Plant Pathology	18	2.6	17	2.9	1	.8	18	6.5	2	.8	18	3.3
Anthropology	13	1.9	6	1.0	7	5.8	3	1.1	7	2.9	6	1.1
Fisheries	12	1.7	12	2.1	0	0.0	12	4.4	5	2.1	12	2.2
Ecology & Systematics	11	1.6	10	1.7	1	.8	1	.4	1	.4	11	2.0
Forestry	11	1.6	8	1.4	3	2.5	8	2.9	8	3.3	8	1.4
Horticulture	10	1.4	4	.7	6	5.0	10	3.6	10	4.1	10	1.8
Natural History	8	1.1	8	1.4	0	0.0	8	2.9	0	0.0	8	1.4
Anatomy	7	1.0	5	.9	2	1.7	2	.7	4	1.7	3	.5
Population Biology	7	1.0	0	0.0	7	5.8	0	0.0	0	0.0	0	0.0
Genetics	6	.9	6	1.0	0	0.0	6	2.2	6	2.5	6	1.1
Oceanography	6	.9	6	1.0	0	0.0	1	.4	0	0.0	6	1.1
Botany & Microbiology	5	.7	5	.9	0	0.0	1	.4	0	0.0	5	.9
Botany & Plant Pathology	5	.7	5	.9	0	0.0	1	.4	1	.4	5	.9
Botany & Range Science	5	.7	0	0.0	5	4.2	0	0.0	0	0.0	0	0.0
Ecology & Behavior	5	.7	5	.9	0	0.0	5	1.8	5	2.1	5	.9
Other (N < 5)	30	4.3	26	4.5	4	3.3	16	5.8	10	4.1	26	4.7

*Rankings are from Academic Science/Engineering: R&D Funds, Fiscal Year 1987, Tables, NSF publication 89-311.

SOURCE: Higher Education Surveys, Systematic Biology Training and Personnel (HES 10), National Science Foundation, 1990.

Table A-8. Systematic biology graduate students, degrees granted, postdoctoral fellows, and full-time faculty, by minority group membership[1], citizenship, and developing country status[2] and selected institutional characteristics: 1988-89 academic year

Category	Selected institutional characteristic											
	All training institutions (N=108)		Public institutions (N=86)		Private institutions (N=22)		Institutions in top 50 R&D: agriculture[3] (N=37)		Institutions in top 50 R&D: biology[3] (N=31)		Land grant institutions (N=79)	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Graduate students												
Total	1,154	100.0	947	100.0	207	100.0	445	100.0	397	100.0	884	100.0
Minority group members	56	4.9	42	4.4	14	6.8	8	1.8	19	4.8	42	4.8
Non-U.S. citizens	156	13.5	120	12.7	36	17.4	58	13.0	58	14.6	111	12.6
From developing countries	114	9.9	94	9.9	20	9.7	48	10.8	40	10.1	94	10.6
Master's degrees: '87-'88												
Total	152	100.0	127	100.0	25	100.0	50	100.0	55	100.0	119	100.0
Minority group members	8	5.3	8	6.3	0	0.0	0	0.0	2	3.6	8	6.7
Non-U.S. citizens	15	9.9	11	8.7	4	16.0	6	12.0	5	9.1	10	8.4
From developing countries	9	5.9	7	5.5	2	8.0	5	10.0	2	3.6	7	5.9
Ph.D. degrees: '87-'88												
Total	151	100.0	131	100.0	20	100.0	60	100.0	51	100.0	134	100.0
Minority group members	5	3.3	5	3.8	0	0.0	2	3.3	2	3.9	5	3.7
Non-U.S. citizens	11	7.3	8	6.1	3	15.0	5	8.3	4	7.8	8	6.0
From developing countries	8	5.3	6	4.6	2	10.0	3	5.0	3	5.9	6	4.5
Postdoctoral fellows												
Total	171	100.0	132	100.0	39	100.0	62	100.0	71	100.0	135	100.0
Minority group members	4	2.3	4	3.0	0	0.0	3	4.8	3	4.2	4	3.0
Non-U.S. citizens	29	17.0	19	14.4	10	25.6	9	14.5	15	21.1	18	13.3
From developing countries	17	9.9	11	8.3	6	15.4	5	8.1	9	12.7	11	8.1
Full-time faculty												
Total	700	100.0	580	100.0	120	100.0	275	100.0	242	100.0	553	100.0
Minority group members	9	1.3	7	1.2	2	1.7	5	1.8	3	1.2	7	1.3
Non-U.S. citizens	23	3.3	21	3.6	2	1.7	21	7.6	21	8.7	21	3.8
From developing countries	2	.3	0	0.0	2	1.7	0	0.0	2	.8	0	0.0

[1]Minority groups are listed in questionnaire on page C-5 of this report.

[2]Developing countries are listed in questionnaire on page C-5 of this report.

[3]Rankings are from Academic Science/Engineering: R&D Funds, Fiscal Year 1987, Tables, NSF publication 89-311.

SOURCE: Higher Education Surveys, Systematic Biology Training and Personnel (HES 10), National Science Foundation, 1990.

Table A-9. Major disciplinary approach within institution for graduate student training in systematic biology by fields from which methods or techniques are drawn: 1988-89 academic year*

Method/technique	Major disciplinary approach for graduate student training							
	Floristic & faunistic surveys		Phylogenetic analysis		Surveys of particular groups		Taxonomic revisions	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total	26	24.1	44	40.7	11	10.2	19	17.6
Behavior	2	7.7	2	4.5	1	9.1	1	5.3
Biogeography	9	34.6	4	9.1	1	9.1	4	21.1
Ecology	13	50.0	7	15.9	7	63.6	7	36.8
Evolution	4	15.4	19	43.2	3	27.3	5	26.3
Genetics	3	11.5	2	4.5	3	27.3	0	0.0
Morphology	14	53.8	27	61.4	4	36.4	15	78.9
Biochemistry	1	3.8	6	13.6	1	9.1	0	0.0
Cell biology	0	0.0	0	0.0	0	0.0	1	5.3
Developmental biology	0	0.0	1	2.3	0	0.0	1	5.3
Molecular biology	2	7.7	16	36.4	2	18.2	3	15.8
Method/technique from other field	0	0.0	3	6.8	0	0.0	1	5.3

*Percents down columns will not total to 100 because respondents were asked to indicate two fields.

SOURCE: Higher Education Surveys, Systematic Biology Training and Personnel (HES 10), National Science Foundation, 1990.

Table A-10. Major disciplinary approach within institution for postdoctoral research in systematic biology by fields from which methods or techniques are drawn: 1988-89 academic year*

Method/technique	Major disciplinary approach for postdoctoral research							
	Floristic & faunistic surveys		Phylogenetic analysis		Surveys of particular groups		Taxonomic revisions	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total	7	6.5	27	25.0	8	7.4	4	3.7
Behavior	1	14.3	2	7.4	2	25.0	0	0.0
Biogeography	1	14.3	3	11.1	0	0.0	3	75.0
Ecology	3	42.9	4	14.8	4	50.0	1	25.0
Evolution	2	28.6	9	33.3	3	37.5	1	25.0
Genetics	0	0.0	3	11.1	2	25.0	0	0.0
Morphology	4	57.1	16	59.3	2	25.0	3	75.0
Biochemistry	0	0.0	4	14.8	1	12.5	0	0.0
Cell biology	0	0.0	0	0.0	1	12.5	0	0.0
Developmental biology	1	14.3	0	0.0	0	0.0	0	0.0
Molecular biology	1	14.3	11	40.7	1	12.5	0	0.0
Method/technique from other field	0	0.0	2	7.4	0	0.0	0	0.0

*Percents down columns will not total to 100 because respondents were asked to indicate two fields.

SOURCE: Higher Education Surveys, Systematic Biology Training and Personnel (HES 10), National Science Foundation, 1990.

Table A-11. Major disciplinary approach within institution for faculty research in systematic biology by fields from which methods or techniques are drawn: 1988-89 academic year*

Method/technique	Major disciplinary approach for faculty research							
	Floristic & faunistic surveys		Phylogenetic analysis		Surveys of particular groups		Taxonomic revisions	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total	22	20.4	44	40.7	14	13.0	17	15.7
Behavior	3	13.6	1	2.3	1	7.1	0	0.0
Biogeography	8	36.4	6	13.6	1	7.1	7	41.2
Ecology	11	50.0	10	22.7	5	35.7	2	11.8
Evolution	4	18.2	19	43.2	6	42.9	3	17.6
Genetics	1	4.5	3	6.8	2	14.3	2	11.8
Morphology	14	63.6	27	61.4	9	64.3	16	94.1
Biochemistry	1	4.5	3	6.8	1	7.1	0	0.0
Cell biology	0	0.0	1	2.3	1	7.1	1	5.9
Developmental biology	0	0.0	2	4.5	0	0.0	0	0.0
Molecular biology	2	9.1	12	27.3	2	14.3	1	5.9
Method/technique from other field	0	0.0	2	4.5	0	0.0	1	5.9

*Percents down columns will not total to 100 because respondents were asked to indicate two fields.

SOURCE: Higher Education Surveys, Systematic Biology Training and Personnel (HES 10), National Science Foundation, 1990.

Table A-12. Major disciplinary approach within institution for faculty research by approach for graduate student training: 1988-89 academic year

Major disciplinary approach for graduate student training	Major disciplinary approach for faculty research									
	Total		Floristic & faunistic surveys		Phylogenetic analysis		Surveys of particular groups		Taxonomic revisions	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total	96	100.0	21	21.9	44	45.8	14	14.6	17	17.7
Floristic & faunistic surveys	25	26.0	16	76.2	1	2.3	2	14.3	6	35.3
Phylogenetic analysis	42	43.8	3	14.3	37	84.1	2	14.3	0	0.0
Surveys of particular groups	11	11.5	1	4.8	2	4.5	8	57.1	0	0.0
Taxonomic revisions	18	18.8	1	4.8	4	9.1	2	14.3	11	64.7

SOURCE: Higher Education Surveys, Systematic Biology Training and Personnel (HES 10), National Science Foundation, 1990.

Table A-13. Vacancies in biology programs and in systematic biology, likely area of new hire, and reason given for hiring in specified area by selected institutional characteristics: 1988-89 academic year

Area/reason	Selected institutional characteristic											
	All training institutions (N=108)		Public institutions (N=86)		Private institutions (N=22)		Institutions in top 50 R&D: agriculture* (N=37)		Institutions in top 50 R&D: biology* (N=31)		Land grant institutions (N=79)	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total biology vacancies	314	100.0	244	100.0	70	100.0	131	100.0	120	100.0	233	100.0
Vacancies in systematics	55	17.5	38	15.6	17	24.3	22	16.8	21	17.5	39	16.7
Likely area for new hire:												
Cellular	14	13.0	7	8.1	7	31.8	4	10.8	4	12.9	6	7.6
Behavioral/ Neural	6	5.8	5	5.8	1	4.5	3	8.1	2	6.5	4	5.1
Molecular	45	41.7	42	48.8	3	13.6	15	40.5	10	32.3	37	46.8
Ecological	19	17.6	16	18.6	3	13.6	6	16.2	7	22.6	14	17.7
Microbiology	1	1.0	1	1.2	0	0.0	0	0.0	0	0.0	0	0.0
Systematic	20	18.5	14	16.3	6	27.3	7	18.9	7	22.6	14	17.7
Reason for area of hire:												
Increased graduate enrollment	5	4.6	4	4.7	1	4.5	2	5.4	2	6.5	3	3.8
Retirements/ departures	31	28.7	23	26.7	8	36.4	9	24.3	11	35.5	21	26.6
Changing department emphasis	30	27.8	24	27.9	6	27.3	10	27.0	6	19.4	21	26.6
More research support	27	25.0	23	26.7	4	18.2	12	32.4	7	22.6	22	27.8
Other reason	12	11.1	10	11.6	2	9.1	2	5.4	4	12.9	10	12.7

*Rankings are from Academic Science/Engineering: R&D Funds, Fiscal Year 1987, Tables, NSF publication 89-311.

SOURCE: Higher Education Surveys, Systematic Biology Training and Personnel (HES 10), National Science Foundation, 1990.

Table A-14. Perceived need for systematic biology positions in disciplinary areas by type of position: 1988-89 academic year*

Area	Position									
	Postdoctoral trainee/ associate (N=108)		Tenure-track faculty (N=108)		Doctoral-level industrial (N=108)		Doctoral-level Federal/State government (N=108)		Nondoctoral research associate (N=108)	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Floristic & faunistic surveys	40	43.0	36	37.9	40	58.8	60	73.2	62	76.5
Phylogenetic analysis	53	57.0	69	72.6	20	29.4	18	22.0	19	23.5
Surveys of particular groups	45	48.4	37	38.9	44	64.7	45	54.9	51	63.0
Taxonomic revisions	38	40.9	40	42.1	16	23.5	32	39.0	17	21.0
Other approaches	6	6.5	7	7.4	7	10.3	6	7.3	8	9.9

*Percents down columns will not total to 100 because respondents were asked to indicate two positions.

SOURCE: Higher Education Surveys, Systematic Biology Training and Personnel (HES 10), National Science Foundation, 1990.

Table A-15. Systematic biology graduate students by source of support and selected institutional characteristics: 1988-89 academic year

Source	Selected institutional characteristic											
	All training institutions (N=108)		Public institutions (N=86)		Private institutions (N=22)		Institutions in top 50 R&D: agriculture* (N=37)		Institutions in top 50 R&D: biology* (N=31)		Land grant institutions (N=79)	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total	1,154	100.0	947	82.1	207	17.9	445	38.6	397	34.4	884	76.6
Federal fellowship	38	3.3	25	2.6	13	6.3	17	3.8	19	4.8	25	2.8
Federal research grant	141	12.2	116	12.2	25	12.1	62	13.9	50	12.6	115	13.0
State fellowship or grant	104	9.0	101	10.7	3	1.4	47	10.6	40	10.1	98	11.1
Formula funds	10	.9	9	1.0	1	.5	8	1.8	7	1.8	10	1.1
Foreign government	33	2.9	30	3.2	3	1.4	14	3.1	12	3.0	30	3.4
Institutional support	629	54.5	514	54.3	115	55.6	208	46.7	178	44.8	492	55.7
Other support	65	5.6	62	6.5	3	1.4	44	9.9	12	3.0	68	7.7
Personal funds	95	8.2	90	9.5	5	2.4	34	7.6	38	9.6	46	5.2
Not determined	39	3.4	0	0.0	39	18.8	11	2.5	41	10.3	0	0.0

*Rankings are from Academic Science/Engineering: R&D Funds, Fiscal Year 1987, Tables, NSF publication 89-311.

SOURCE: Higher Education Surveys, Systematic Biology Training and Personnel (HES 10), National Science Foundation, 1990.

Table A-16. Systematic biology postdoctoral fellows by source of support and selected institutional characteristics: 1988-89 academic year

Source	Selected institutional characteristic											
	All training institutions (N=108)		Public institutions (N=86)		Private institutions (N=22)		Institutions in top 50 R&D: agriculture* (N=37)		Institutions in top 50 R&D: biology* (N=31)		Land grant institutions (N=79)	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total	174	100.0	132	75.9	42	24.1	62	35.6	71	40.8	128	73.6
Federal fellowship	16	9.2	13	9.8	3	7.1	3	4.8	9	12.7	10	7.8
Federal research grant	64	36.8	51	38.6	13	31.0	28	45.2	23	32.4	54	42.2
State fellowship or grant	10	5.7	10	7.6	0	0.0	6	9.7	2	2.8	10	7.8
Formula funds	1	.6	1	.8	0	0.0	1	1.6	1	1.4	1	.8
Foreign government	21	12.1	15	11.4	6	14.3	2	3.2	9	12.7	14	10.9
Institutional support	14	8.0	11	8.3	3	7.1	8	12.9	8	11.3	11	8.6
Other support	31	17.8	22	16.7	9	21.4	4	6.5	10	14.1	19	14.8
Personal funds	10	5.7	9	6.8	1	2.4	9	14.5	5	7.0	9	7.0
Not determined	7	4.0	0	0.0	7	16.7	1	1.6	4	5.6	0	0.0

*Rankings are from Academic Science/Engineering: R&D Funds, Fiscal Year 1987, Tables, NSF publication 89-311.

SOURCE: Higher Education Surveys, Systematic Biology Training and Personnel (HES 10), National Science Foundation, 1990.

Table A-17. Grant amounts for systematic biology research received in 1987-88 by source and selected institutional characteristics: 1988-89 academic year

Source	Selected institutional characteristic					
	All training institutions (N=108)	Public institutions (N=86)	Private institutions (N=22)	Institutions in top 50 R&D: agriculture* (N=37)	Institutions in top 50 R&D: biology* (N=31)	Land grant institutions (N=79)
	Amount	Amount	Amount	Amount	Amount	Amount
Total	$35,520,642	$19,914,288	$15,606,354	$7,405,373	$7,183,871	$19,861,242
Federal government	22,087,194	15,606,793	6,480,401	5,885,209	6,004,532	15,717,509
State government	2,165,038	1,978,405	186,633	1,006,450	612,195	1,853,789
Foreign government	361,431	319,326	42,105	122,538	181,259	291,807
Other government	233,811	233,811	0	39,699	35,829	227,580
Other	10,673,168	1,775,953	8,897,215	351,477	350,056	1,770,557

*Rankings are from Academic Science/Engineering: R&D Funds, Fiscal Year 1987, Tables, NSF publication 89-311.

SOURCE: Higher Education Surveys, Systematic Biology Training and Personnel (HES 10), National Science Foundation, 1990.

Table A-18. Distribution of grants for systematic biology research received in 1987-88 by source and selected institutional characteristics: 1988-89 academic year (amounts in thousands of dollars)

Source	Selected institutional characteristic											
	All training institutions (N=108)		Public institutions (N=86)		Private institutions (N=22)		Institutions in top 50 R&D: agriculture* (N=37)		Institutions in top 50 R&D: biology* (N=31)		Land grant institutions (N=79)	
	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent
Total	$35,521	100.0	$19,914	56.1	$15,606	43.9	$7,405	20.8	$7,184	20.2	$19,861	55.9
Federal government	22,087	62.2	15,607	78.4	6,480	41.5	5,885	79.5	6,004	83.6	15,718	79.1
State government	2,165	6.1	1,978	9.9	187	1.2	1,006	13.6	612	8.5	1,854	9.3
Foreign government	361	1.0	319	1.6	42	.3	122	1.7	181	2.5	292	1.5
Other government	234	.7	234	1.2	0	0.0	40	.5	36	.5	228	1.1
Other	10,673	30.0	1,776	8.9	8,897	57.0	351	4.7	350	4.9	1,770	8.9

*Rankings are from Academic Science/Engineering: R&D Funds, Fiscal Year 1987, Tables, NSF publication 89-311.

SOURCE: Higher Education Surveys, Systematic Biology Training and Personnel (HES 10), National Science Foundation, 1990.

APPENDIX B

Technical Notes

Higher Education Surveys (HES)

The Higher Education Surveys (HES) system was established to conduct brief surveys of higher education institutions on topics of interest to Federal policymakers and the educational community. The system is sponsored by the National Science Foundation, the U.S. Department of Education, and the National Endowment for the Humanities.

HES questionnaires typically request a limited amount of readily accessible data from a subsample of institutions in the HES panel, which is a nationally representative sample of 1,093 colleges and universities in the United States. Each institution in the panel has identified a HES campus representative, who serves as survey coordinator. The campus representative facilitates data collection by identifying the appropriate respondent for each survey and distributing the questionnaire to that person.

Survey Methodology - Systematic Biology Training and Personnel Survey

This mail survey on systematic biology training and personnel was conducted at the request of the National Science Foundation (NSF), Task Force on Global Biodiversity of the Committee on International Science. The information was collected to provide reliable national estimates of the human resource base in systematics to aid in assessing the need for intervention by NSF.

The respondents for this survey consisted of all of the doctorate-granting institutions in the United States, as defined by the U.S. Department of Education's National Center for Education Statistics. The questionnaire and cover letter were mailed to institutions on December 16, 1988. Telephone followup of non-respondents was conducted from mid-January to mid-March, 1989. Data were collected by telephone from 44 respondents. Data were adjusted for nonresponse.[12] An overall response rate of 96 percent was obtained from the 168 eligible institutions. The response rate among public and private institutions was similar (96 percent and 95 percent, respectively).

Description of Institutional Type

Based on the U.S. Department of Education's Higher Education General Information Survey (HEGIS) classification, doctorate-granting institutions are characterized by a significant level of activity in and commitment to doctoral-level education as measured by the number of doctorate recipients and the diversity in doctoral-level program offerings. Included in this category are institutions that are not considered specialized schools and that grant a minimum of 30 doctoral-level degrees per year. These degrees must be in three or more doctoral-level program areas or have an inter-disciplinary program at the doctorate level. Included in the counts of doctorate degrees are the first-professional medical degrees.

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[12] To account for the 4 percent of schools that did not respond to the survey, the 57 private school responses were each multiplied by 1.05 to represent the 60 schools in that population, and the 104 public school responses were each multiplied by 1.04 to represent the 108 schools in that population.

Figure B-1. Institutions that Responded to the HES #10 Survey

Adelphi Univ.
American Univ.
Arizona St. Univ.
Auburn Univ. - Main
Ball St. Univ.
Boston College
Boston Univ.
Bowling Green St. Univ. - Main
Brandeis Univ.
Brigham Young Univ. - Main
Brown Univ.
Bryn Mawr College
Calif. Inst. of Tech.
Carnegie-Mellon Univ.
Case Western Reserve Univ.
Catholic Univ. of America
Clark Univ.
Clemson Univ.
Colorado St. Univ.
Columbia Univ. - Main Division
Cornell Univ.
CUNY - Grad. School & Univ. Ctr.
Dartmouth College
Drew Univ.
Duke Univ.
Emory Univ.
Florida St. Univ.
Fordham Univ.
George Washington Univ.
Georgetown Univ.
Georgia St. Univ.
Howard Univ.
Illinois Inst. of Tech.
Illinois St. Univ.
Indiana Univ. - Bloomington
Iowa St. Univ. of Sci. & Tech.
Johns Hopkins Univ.
Kansas St. Univ. of Agri. & App. Sci.
Kent St. Univ. - Main
Lehigh Univ.
Louisiana St. Univ. & A&M College
Loyola Univ. of Chicago
Marquette Univ.
Massachusetts Inst. of Tech.
Memphis St. Univ.
Miami Univ. - Oxford Camp.
Michigan St. Univ.
Mississippi St. Univ.
New Mexico St. Univ. - Main
New School for Social Research
New York Univ.
North Carolina St. Univ. - Raleigh
Northern Illinois Univ.
Northwestern Univ.
Ohio St. Univ. - Main
Ohio Univ. - Main
Oklahoma St. Univ. - Main
Oregon St. Univ.
Pennsylvania St. Univ.
Princeton Univ.
Purdue Univ. - Main
Rand Grad. Inst. for Policy Studies
Rensselaer Poly. Inst.
Rice Univ.
Rockefeller Univ.
Rutgers Univ. - New Brunswick
Saint John's Univ. - New York
Saint Louis Univ. - Main
Southern Illinois Univ. - Carbondale
Southern Methodist Univ.
SUNY - Albany
SUNY - Binghamton
SUNY - Buffalo
SUNY - Stony Brook - Main
Syracuse Univ. - Main
Temple Univ.
Texas A&M Univ. - Main
Texas Tech Univ.
Texas Woman's Univ.
Tufts Univ.
Tulane Univ. of Louisiana
United States International Univ.
Univ. of Akron - Main
Univ. of Alabama
Univ. of Alabama - Birmingham
Univ. of Arizona
Univ. of Arkansas - Main
Univ. of Calif. - Berkeley
Univ. of Calif. - Davis
Univ. of Calif. - Irvine
Univ. of Calif. - Los Angeles
Univ. of Calif. - Riverside
Univ. of Calif. - San Diego
Univ. of Calif. - Santa Barbara
Univ. of Calif. - Santa Cruz
Univ. of Chicago
Univ. of Cincinnati - Main
Univ. of Colorado at Boulder
Univ. of Connecticut
Univ. of Delaware
Univ. of Denver
Univ. of Detroit
Univ. of Georgia
Univ. of Hawaii at Manoa
Univ. of Houston - Univ. Park
Univ. of Idaho
Univ. of Illinois at Chicago
Univ. of Illinois - Urbana Camp.
Univ. of Iowa
Univ. of Kansas - Main
Univ. of Kentucky
Univ. of Louisville
Univ. of Mass. - Amherst Camp.
Univ. of Miami
Univ. of Minnesota - Minn./St. Paul
Univ. of Mississippi - Main
Univ. of Missouri - Columbia
Univ. of Missouri - Kansas City
Univ. of Nebraska - Lincoln
Univ. of Nevada - Reno
Univ. of New Hampshire
Univ. of New Mexico - Main
Univ. of North Carolina - Chapel Hill
Univ. of North Carolina - Greensboro
Univ. of North Dakota - Main
Univ. of North Texas
Univ. of Northern Colorado
Univ. of Notre Dame
Univ. of Oklahoma - Norman Camp.
Univ. of Oregon
Univ. of Pennsylvania
Univ. of Pittsburgh
Univ. of Rhode Island
Univ. of Rochester
Univ. of South Carolina - Columbia
Univ. of South Dakota - Main
Univ. of South Florida
Univ. of Southern Calif.
Univ. of Southern Mississippi
Univ. of Tennessee Knoxville
Univ. of Texas - Austin
Univ. of Texas - Dallas
Univ. of the Pacific
Univ. of Toledo
Univ. of Utah
Univ. of Vermont & St. Agri. College
Univ. of Virginia - Main
Univ. of Washington
Univ. of Wisconsin - Milwaukee
Univ. of Wyoming
Utah St. Univ.
Vanderbilt Univ.
Virginia Commonwealth Univ.
Virginia Poly. Inst. & St. Univ.
Washington St. Univ.
Washington Univ.
Wayne St. Univ.
West Virginia Univ.
Western Michigan Univ.
Yale Univ.
Yeshiva Univ.

APPENDIX C

Survey Questionnaire

Higher Education Surveys

OMB # 3145-0009
Exp. 1/31/90

SURVEY #10
SYSTEMATIC BIOLOGY
TRAINING AND PERSONNEL

December 1988

Dear Colleague,

I am writing on behalf of the National Science Foundation to request your participation in our Higher Education Survey (HES) on *Systematic Biology Training and Personnel*.

In October of 1987 the National Science Board of NSF established a Task Force on Global Biodiversity. One job of the Task Force is to evaluate the scientific resources, including the human resource base, currently available to understand and manage global biodiversity. We in the Task Force sense that the human resource base supporting Systematic Biology is not large enough to successfully undertake the important task before it, but realize that in order to provide focused recommendations for the proper agencies to confront and deal with this problem anecdotal evidence is not enough; better data are needed. This survey will provide these data.

As you read the questionnaire, you will see why it is essential to have someone familiar with Systematic Biology coordinate the data collection. We are sending the survey to all 170 doctoral-granting institutions in the United States, and thus it is not possible to contact each of you individually, but your name was suggested by the staff of NSF's Systematic Biology Program as being well qualified for this task. Please be aware, though, that it will be necessary for you to work with Systematic Biologists in other departments to produce complete and accurate institution-wide data.

The survey is being conducted for us by HES, which is jointly sponsored by NSF, the Department of Education, and the National Endowment for the Humanities. If you have any questions about this survey, contact the HES coordinator at your institution, or call Carin Celebuski of Westat at 1-800-937-8281 x3986.

Thank you for your assistance. We believe the goal will be worth our combined efforts.

Sincerely,

W. Franklin Harris
Executive Secretary
Task Force on Global Biodiversity

Systematic Biology is the discipline that treats biological diversity at the organismal and population levels with special reference to the classification, evolution and distribution of particular groups of organisms. Excluded are comparative studies in anatomy, behavior, biochemistry, and the like unless they are directed principally toward classification and phylogeny.

1. Please indicate the major administrative units at your institution that are the primary focus for training graduate students in Systematic Biology. (CHECK ALL THAT APPLY)

   ☐ Division/College of Arts and Sciences/Sciences

   ☐ Division/College of Agriculture/Forestry/Natural Resources

   ☐ Other division (specify) _____

   ☐ Not currently training graduate students in Systematic Biology (SKIP TO QUESTION 9)

2. Please list the department(s) training graduate students majoring in Systematic Biology in 1988-89 at your institution, and, for each department, indicate the numbers of:

   I. Systematic Biology graduate students,
   II. Full-time faculty engaged in Systematic Biology research or training,
   III. Adjunct faculty engaged in Systematic Biology research or training, and
   IV. Support personnel for Systematic Biology.

   Count each person only once in each column (i.e., with his/her major department affiliation).

ADJUNCT FACULTY
Faculty who do not have full-time appointments, including those who primarily work in other facilities such as museums and agricultural experiment stations

		NUMBER OF SYSTEMATIC BIOLOGY:			
			FACULTY		
	DEPARTMENT	I. GRADUATE STUDENTS	II. FULL-TIME	III. ADJUNCT	IV. SUPPORT PERSONNEL
a.	_____	_____	_____	_____	_____
b.	_____	_____	_____	_____	_____
c.	_____	_____	_____	_____	_____
d.	_____	_____	_____	_____	_____
e.	_____	_____	_____	_____	_____
f.	_____	_____	_____	_____	_____

3. In column I below, please report the total numbers of:

   a. Systematic Biology graduate students,
   b. Master's degree recipients in Systematic Biology in 1987-88,
   c. Ph.D. degree recipients in Systematic Biology in 1987-88,
   d. Postdoctoral fellows/associates in Systematic Biology, and
   e. Full-time Systematic Biology faculty.

   In column II, report the numbers (of those in column I) who are members of the minority racial/ethnic groups given below. (Do not include non-U.S. Citizens on temporary visas.)

   In column III, report the numbers (of those in column I) who are non-U.S. citizens on temporary visas.

   In column IV, report the numbers (of those in column III) who are from developing countries.

MINORITY RACIAL/ETHNIC GROUPS
American Indian/Alaskan Native, Asian or Pacific Islander, Black, or Hispanic
DEVELOPING COUNTRIES BY REGION
Countries in Latin America and the Caribbean
Countries in the Far East, excluding Japan
Countries in South Asia, including India, Afghanistan, Bangladesh, Pakistan, and Sri Lanka
Countries in Africa, excluding South Africa
Countries in the Near and Middle East, including Turkey, Iran, Saudi Arabia, Lebanon, Jordan and Syria

	NUMBER IN SYSTEMATIC BIOLOGY			
			NON-U.S. CITIZENS ON TEMPORARY VISAS	
CATEGORY	I. TOTAL	II. MINORITY GROUP MEMBERS	III. SUBTOTAL	IV. FROM DEVELOPING COUNTRIES
a. Graduate students	_____	_____	_____	_____
b. Master's degree recipients in 1987-88	_____	_____	_____	_____
c. Ph.D. degree recipients in 1987-88	_____	_____	_____	_____
d. Postdoctoral fellows/associates	_____	_____	_____	_____
e. Full-time faculty	_____	_____	_____	_____

4. Please check the one disciplinary approach within Systematic Biology (rows a through d below) that has the major emphasis at your institution in the training/research areas (columns) listed below.

Then, for the disciplinary approach checked in each column, indicate the two analytic methods/techniques (rows e through o below) that have the major emphasis.

		TRAINING/RESEARCH AREA		
	DISCIPLINARY APPROACH WITHIN SYSTEMATIC BIOLOGY (CHECK 1 FOR EACH COLUMN)	I. GRADUATE STUDENT TRAINING	II. POST-DOCTORAL RESEARCH	III. FACULTY RESEARCH
a.	Floristic & Faunistic Surveys	_____	_____	_____
b.	Phylogenetic Analysis	_____	_____	_____
c.	Surveys of Particular Groups	_____	_____	_____
d.	Taxonomic Revisions	_____	_____	_____
	ANALYTIC METHOD/TECHNIQUE USED IN DISCIPLINARY APPROACH CHECKED ABOVE (CHECK 2 FOR EACH COLUMN)			
e.	Behavior	_____	_____	_____
f.	Biogeography	_____	_____	_____
g.	Ecology	_____	_____	_____
h.	Evolution	_____	_____	_____
i.	Genetics	_____	_____	_____
j.	Morphology	_____	_____	_____
k.	Biochemistry	_____	_____	_____
l.	Cell Biology	_____	_____	_____
m.	Developmental Biology	_____	_____	_____
n.	Molecular Biology	_____	_____	_____
o.	Other (specify) _____	_____	_____	_____

5. For which disciplinary approaches is the need to create new positions most urgent for the health of Systematic Biology in general? Please check the two disciplinary areas that have the greatest need for each position (column) listed below.

DISCIPLINARY APPROACH WITHIN SYSTEMATIC BIOLOGY (CHECK 2 FOR EACH COLUMN)	NEED FOR SYSTEMATIC BIOLOGY POSITIONS AS: I. POST-DOCTORAL TRAINEE/ ASSOCIATE	II. TENURE TRACK FACULTY	III. DOCTORAL LEVEL INDUSTRIAL	IV. DOCTORAL LEVEL FEDERAL/ STATE GOVERNMENT	V. NON-DOCTORAL RESEARCH ASSOCIATE
a. Floristic & Faunistic Surveys					
b. Phylogenetic Analysis					
c. Surveys of Particular Groups					
d. Taxonomic Revisions					
e. Other (specify) _____					

6. Please classify each of your Systematic Biology graduate students and postdoctoral fellows/associates by their major source of support. Count each individual only once. The totals should agree with the corresponding totals in question 3.

MAJOR SOURCE OF SUPPORT	NUMBER OF GRADUATE STUDENTS	NUMBER OF POSTDOCTORAL FELLOWS/ ASSOCIATES
a. Federal fellowship		
b. Federal research grant		
c. State fellowship or grant		
d. Formula funds		
e. Foreign government		
f. Institutional support		
g. Other support		
h. Personal funds		
i. TOTAL NUMBER (sum of a - h)		

7. Please report, by source, the value of grants for Systematic Biology research received in 1987-88. If exact figures are not available, please estimate. If any of the awards is multi-year, please show only that portion that supported research during 1987-88. For each source, indicate the total value of:

I. Research and support grants going directly to graduate students or postdoctoral fellows/associates,
II. Research and support grants going to the institution and to individual departments and faculty, and
III. All research and support grants (which should be the sum of columns I and II for each source).

	GRANT SOURCE	I. GRANTS TO GRADUATE STUDENTS, POSTDOCTORAL FELLOWS/ASSOCIATES	II. GRANTS TO INSTITUTIONS, DEPARTMENTS, FACULTY	III. TOTAL GRANTS
a.	Federal government	$_____	$_____	$_____
b.	State government	$_____	$_____	$_____
c.	Foreign government	$_____	$_____	$_____
d.	Other government or public funds (e.g county or other municipal)	$_____	$_____	$_____
e.	Other sources	$_____	$_____	$_____
f.	ALL SOURCES (sum of a-e)	$_____	$_____	$_____

8. Questions 8a through 8d concern faculty vacancies in Biology at your institution.

a. How many full-time faculty vacancies (unfilled budgeted positions) exist as of the fall of 1988 in all your Biology programs?

_____ Biology vacancies as of fall 1988

b. How many of the vacancies listed in 8a are in Systematic Biology?

_____ Systematic Biology vacancies as of fall 1988

c. If you were given an additional full-time faculty position to be filled by a biologist, from which area of biology would you most likely hire? (CHECK ONLY ONE)

- ☐ Cellular
- ☐ Behavioral and Neural
- ☐ Molecular
- ☐ Ecological
- ☐ Microbiology
- ☐ Systematic

d. What is the major reason that you would hire from this area of biology? (CHECK ONE)

- ☐ Increased graduate enrollments
- ☐ Faculty retirements/departures
- ☐ Changing emphasis in the Department
- ☐ Greater opportunities for research support in this area
- ☐ Other (specify) _____

9. May we have your permission to release this data to the National Science Foundation with the institution identifier intact? This would allow NSF to use data from other surveys (e.g., IPEDS) to help analyze the results. All information published by NSF will be in aggregate form only.

- ☐ Yes
- ☐ No

Please sign _____

Please provide your name and phone number, in case additional information or clarification are needed.

Name: _____

Phone Number: _____/_____

Thank you for your assistance. Please return this form by **January 10, 1989** to:

Higher Education Surveys
Westat
1650 Research Boulevard
Rockville, MD 20850

Please keep a copy of this survey for your records.

If you have any questions or problems concerning this survey, please call Carin Celebuski at:

800/937-8281 x3986 (toll free)

END

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Date Filmed

March 21,1991